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(54) DIGITAL VIDEO DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide the digital video device capable of restricting
the number of times of a copy on account of deterioration of a picture whenever it is
copied like an analog video device.
SOLUTION: A noise information generating part is provided either or both of a
compression decoding part 13 on the reproducing side and a compression coding part 22
on the recording side, and noise information which cannot be discriminated by
processing a digital video data only one time at the time of reproducing a picture is
burried in the noise information generating part. Consequently, although copying itself

is feasible, the picture is remarkably deteriorated by repeating its copy plural times, thus substantially restricting the number of copying times.

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CLAIMS

[Claim(s)]
[Claim 1] Digital video equipment characterized by establishing the means which embeds the noise information on extent which is not discriminable from a record medium by one processing in the digital video data read from the record medium in the digital video equipment which reproduces a digital video data at the time of image reconstruction.

[Claim 2] Digital video equipment characterized by establishing the means which embeds the noise information on extent which is not discriminable in one processing at the time of image reconstruction into the digital video data which writes a digital video data in a record medium in the digital video equipment recorded on a record medium.

[Claim 3] In the digital video equipment which reproduces a digital video data from a record medium while recording a digital video data on a record medium The noise information on extent which is not discriminable by one processing at the time of image reconstruction in the digital video data written in the means or record medium which embeds the noise information on extent which is not discriminable in one processing at the time of image reconstruction into the digital video data read from the record medium Digital video equipment characterized by establishing both both [either or] to embed.

[Claim 4] Digital video equipment which elongates and carries out reverse orthogonal transformation of the digital video data, and is characterized by preparing the noise information generating section in the compression decode section, and superimposing noise information in digital video equipment equipped with the compression decode section understood further a blocked part at the time of decode of a digital video data.

[Claim 5] Digital video equipment characterized by blocking a digital video data, carrying out orthogonal transformation of each block, preparing the noise information generating section in the compression coding section in digital video equipment equipped with the compression coding section compressed further, and superimposing noise information at the time of coding of a digital video data.

[Claim 6] The digital video equipment carry out blocking a digital video data, preparing the noise information generating section in both the compression decode section, or compression coding both [either or] in the digital video equipment which it had in the compression coding section which carries out orthogonal transformation of each block, and compresses further, and the compression decode section which elongates a digital video data and carry out reverse orthogonal transformation, and which understand a blocked part further, and superimposing noise information at both both

[either or] of decode of a digital video data, or coding as the description.

[Claim 7] claim 4 characterized by superimposing noise information on the low frequency component of the frequency component matrix acquired by orthogonal transformation thru/or 6 -- either -- the digital video equipment of a publication.

[Claim 8] claim 4 characterized by superimposing noise information on the inside frequency component of the frequency component matrix acquired by orthogonal transformation thru/or 6 -- either -- the digital video equipment of a publication.

[Claim 9] claim 4 characterized by superimposing noise information on the high frequency component of the frequency component matrix acquired by orthogonal transformation thru/or 6 -- either -- the digital video equipment of a publication.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to digital video equipments, such as a digital video disc and a digital video tape, especially the digital video equipment which can restrict the count of dubbing (copy).

[0002]

[Description of the Prior Art] As everyone knows, even if a wave deteriorates, playback and restoration are easy for a digital signal, and the error correction of compensating the missing pulse with the digital signal encoded further, or removing

the pulse mixed by the noise etc. is also possible for it. With the digital video equipment treating the digital video data using such a digital signal, even if it repeats a copy over what generation, a signal does not change, that is, since image quality does not deteriorate, there is a possibility that a lot of unjust duplicate objects may overflow, as what was copied is copied further.

[0003] For this reason, the scramble signal which consists of a pseudo-random sign is conventionally superimposed in the digital video data by the side which offers information. That the contents cannot grasp at all but make the use improper (meaningless even if it copies) with the equipment which is not equipped with the decoder circuit **** (for example, to JP,6-124539,A) the class of device connected is detected and the digital video tape recorder which carries out scramble processing according to the class is indicated. When the digital copy was performed, as a digital copy could not be carried out twice or more in succession, copyright was protected by adding the recognition signal which expresses the fact with an equipment side to a digital video data.

[0004]

[Problem(s) to be Solved by the Invention] However, by the approach of superimposing the scramble signal mentioned above, while the big decoder circuit of a scale was needed for the equipment by the side of playback for scramble discharge and causing enlargement of equipment, and the rise of cost, after the scramble was canceled, there was a problem that it could copy freely. Moreover, also by the approach of enabling a digital copy once, when removing the recognition signal or making the detector into the invalid, there was a problem that it could copy freely.

[0005] The approach of, performing scramble processing which the view that it is more desirable to enable a certain amount of count copy if it is in the condition of having deteriorated in extent which can grasp the contents rather than it makes the copy itself completely impossible also has, and mentioned above in this case, or enabling a digital copy once was not suitable. [the approach] [making an image into an invisible condition completely on the other hand for PR of a work]

[0006] Like analog video equipment, whenever it copies, an image deteriorates, and the purpose of this invention is to offer the digital video equipment which can restrict the count of a copy by this.

[0007]

[Means for Solving the Problem] In this invention, in order to attain said purpose, the means which embeds the noise information on extent which is not discriminable from a record medium by one processing in the digital video data read from the record

medium in the digital video equipment which reproduces a digital video data at the time of image reconstruction was established.

[0008] Moreover, by one processing, the means which embeds the noise information on extent which is not discriminable at the time of image reconstruction was established into the digital video data which writes a digital video data in a record medium in the digital video equipment recorded on a record medium.

[0009] Moreover, while having recorded a digital video data on a record medium, both both [either or] which embed the noise information on extent which is not not discriminable from a record medium by one processing at the time of image reconstruction in the digital video data written in the means or the record medium which embeds the noise information on extent which is not discriminable by one processing in the digital video data read from the record medium in the digital video equipment which reproduces a digital video data at the time of image reconstruction established.

[0010] It deteriorates, so that an image will not bear admiration, if it repeats two or more times, although the copy itself is possible like analog video equipment by embedding the noise information of extent which is not discriminable to a digital video data by one processing in either at the time of the time of playback, or record, or both at the time of image reconstruction according to this invention, and this can restrict the count of a copy substantially.

[0011]

[Embodiment of the Invention] Hereafter, this invention is explained in full detail based on a drawing.

[0012] Drawing 1 shows an example of the gestalt of operation of this invention, and shows signs that an analog copy is performed using the digital video equipment of both by the side of playback and record, and these here. That is, among drawing, ten are digital video equipment by the side of playback, and consist of the recovery section 11, the error correction decode section 12, the compression decode section 13, a synchronizing signal adjunct 14, and a digital-to-analog transducer (D/A) 15. Moreover, 20 is digital video equipment by the side of record, and consists of the analog-to-digital-conversion section (A/D) 21, the compression coding section 22, the error correcting code-ized section 23, and the modulation processing section 24.

[0013] During said configuration, the compression decode section 13 and the compression coding section 22 are equipped with the noise information generating section, and have the function which superimposes the noise information on extent which is not discriminable at the time of image reconstruction by one processing in a

digital video data. In addition, other configurations are the same as that of the case of conventional digital video equipment.

[0014] In the digital video equipment 10 by the side of said playback, serial/parallel conversion is carried out, the error correction decode section 12 is supplied, and, as for the playback digital video data reproduced from the record medium and signal regeneration system which are not illustrated, data detection and the data by which the error correction was carried out here are supplied to the compression decode section 13 by the recovery section 11. In the compression decode section 13, while solving the compression of data by which the error correction was carried out, noise information is multiplexed. Thus, it decodes, and a synchronizing signal is added by the synchronizing signal adjunct 14, and D/A conversion of the video data superimposed on noise information is carried out by the D/A transducer 15, and it is taken out as an analog video signal with which the noise was embedded.

[0015] Moreover, although A/D conversion of the analog video signal mentioned above is inputted and carried out to the A/D-conversion section 21 of the digital video equipment 20 by the side of record and it serves as a digital video data, since the noise is embedded, many quantization errors will come out rather than usual. This digital video data is supplied to the compression coding section 22, and noise information is multiplexed while being compressed here. Thus, it is compressed, and the data with which it was superimposed on noise information are error-correcting-code-ized in the error correcting code-ized section 23, and are outputted to the signal recording system and record medium which serve as a digital video data for record, and are not further illustrated in response to record modulation processing of parallel/serial conversion etc. in the record modulation processing section 24.

[0016] Thus, in case a digital video data is reproduced, and it records on a list as a digital video data, the copy itself is possible by superimposing the noise information on extent which is not discriminable in one processing at the time of image reconstruction, but since an image deteriorates so that noise information increases whenever it repeats a copy, and admiration is not borne soon, the count of a copy can be restricted substantially.

[0017] Although the above explanation is the case of an analog copy, since the noise information mentioned above is what [a thing] on which it is superimposed in a digital-signal-processing process digital, it cannot be overemphasized that it is useful also in a digital copy which inputs the output of the synchronizing signal adjunct 14 into the compression coding section 22. In addition, the configuration of the usual

digital video equipment in which record and playback are possible becomes what combined the configuration of the digital video equipment by the side of the record mentioned above and playback (the signal recording system and reversion system to a record medium are included.).

[0018] Moreover, the same effectiveness is acquired although the example which embeds noise information by both by the side of record and playback was explained, and noise information is embedded by either record or playback. Therefore, it is useful even if it applies to playback special-purpose machines, such as a digital video disc.

[0019] Drawing 2 shows the concrete configuration of the compression decode section 13 which multiplexes the noise information mentioned above, and, for the reverse variable-length decode section and 132, as for the reverse DCT (discrete cosine transform) section and 134, the reverse quantization section and 133 are [131 / the block configuration section and 135] the noise information generating sections among drawing.

[0020] Reverse variable-length decode (elongation) is carried out in the reverse variable-length decode section 131, and the data by which the error correction was carried out in the error correction decode section 12 are reverse-quantized in the reverse quantization section 132. The noise information generating section 135 is connected to this reverse quantization section 132 or the reverse variable-length decode section 131, in case [in which it reverse-quantizes by the suitable quantization multiplier] reverse variable-length decode in the case is carried out, the value of a DCT (discrete cosine transform) multiplier is changed, and noise information is multiplexed to a video data. A quantization multiplier may be made to be rewritten based on the quantization data in an input signal, as long as it sets it as a general-purpose value at first, it rewrites in the inputted video data and there is a control signal. And the data with which this noise was embedded are changed in the reverse DCT section 133, and turn into data of 8x8 units, and a DESHAFU ring, a data interpolation, etc. are performed in the block configuration section 134.

[0021] Drawing 3 shows the concrete configuration of the compression coding section 22 which multiplexes noise information, and, for the block division section and 222, as for the quantization section and 224, a DCT transducer and 223 are [221 / the variable-length-coding section and 225] the noise information generating sections among drawing (in addition, the flow of the signal in this Fig. is contrary to the case of drawing 1 .).

[0022] The video data by which A/D conversion was carried out in the A/D-conversion section 21 is divided into a 8x8-pixel block in the block division

section 221, and DCT conversion is carried out for every block by the DCT transducer 222. the video data by which DCT conversion was carried out is quantized in the quantization section 223 -- having -- the variable-length-coding section 224 -- variable length coding -- for example, Huffman coding is carried out. The noise information generating section 225 is connected to this quantization section 223 or the variable-length-coding section 224, in case it quantizes, or in case variable length coding is carried out, the value of a specific DCT multiplier is changed and noise information is multiplexed to a video data.

[0023] It is a design-matter for the amount and which DCT multiplier of noise information in the case of the noise embedding described above a noise is embedded, and when the low-frequency component of a DCT multiplier (frequency component matrix acquired by orthogonal transformation) is chosen and a noise is embedded, the image of the shape of a light-and-darkness ripple entering encaustic can be degraded, maintaining the configuration of an image. moreover, the image with which the configuration of an image itself collapsed when a noise was embedded for the inside cycle component of a DCT multiplier -- degradation -- now, it can go. When a noise is embedded at the high frequency component of a DCT multiplier, the image with which white noise rode can be degraded further again.

[0024]

[Effect of the Invention] As explained above, although the copy itself is possible like analog video equipment by embedding the noise information on extent which is not discriminable by one processing to a digital video data at the time of image reconstruction [at both both / either or / of playback or record] according to this invention If a multiple-times copy is repeated, the digital video equipment with which an image deteriorates remarkably can be offered, by this, the copy covering many times is prevented and protection of copyright is enabled.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram showing an example of the gestalt of operation of this invention

[Drawing 2] The block diagram showing an example of the configuration of the compression decode section

[Drawing 3] The block diagram showing an example of the configuration of the compression coding section

[Description of Notations]

10 -- The digital video equipment by the side of playback, 11 -- The recovery section, 12 -- Error correction decode section, 13 -- The compression decode section, 14 -- A synchronizing signal adjunct, 15 -- Digital-to-analog transducer, 20 -- The digital video equipment by the side of record, 21 -- Analog-to-digital-conversion section, 22 -- The compression coding section, 23 -- The error correcting code-ized section, 24 -- Modulation processing section, 131 [-- The block configuration section, 135 / -- The noise information generating section, 221 / -- The block division section, 222 / -- A DCT transducer, 223 / -- The quantization section, 224 / -- The variable-length-coding section, 225 / -- Noise information generating section.] -- The reverse variable-length decode section, 13 -- The reverse quantization section, 133 -- The reverse DCT section, 134